Background and Aims

Dreaming is a particular form of consciousness that occurs during sleep. Although mental activity is most frequently and vividly recalled when awakening from REM sleep, it is also reported in up to 80% of Non-REM (NREM) sleep awakenings.

Slow waves, the hallmark of NREM sleep, reflect a slow oscillation of cortical neurons between up and down states. It has been suggested that the brain’s capacity to integrate information and generate conscious experiences is reduced whenever the brain is in such a bistable state.

Are slow waves negatively associated with sleep consciousness?

Can machine-learning techniques distinguish between periods with consciousness and unconsciousness in sleep?

Methods

- Two healthy participants
- 16 overnight hd-EEG recordings (256 electrodes)
- 290 awakenings (222 in N2 and N3)
- Many awakenings, few subjects to account for interindividual variation in sleep consciousness and EEG
- Assessment of sleep consciousness:
  - No conscious experience
  - Conscious experience with recall of content
- Assessment of richness and length of dream
- Time frequency transform of EEG signal 2 min before awakening
- Slow-wave detection algorithm for identification of slow waves
- Multivariate pattern analysis (L2-regularized logistic regression) for EEG signal within delta band (1-4.5 Hz)
- Multivariate pattern analysis for detection of slow waves
- Assessment of richness and length of dream
- Conscious experience (CE)• Conscious experience without recall (CWR)

Conclusions

Our results suggest that the brain’s capacity to generate conscious experience during sleep is reduced in the presence of slow waves. Initial analyses indicate that machine learning techniques can predict the presence of slow consciousness.

References